Digital Persuasion: Effects of web-based information and beliefs on meat consumption attitudes, and intentions

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Abstract

Defense mechanisms are a common reaction to social activism. With global protests such as the Occupy movement, and increasing urgency of climate change action, defense mechanisms in response to activism are a pertinent area for research. Three hundred sixty three participants viewed environmental, health, and ethical arguments in favour of reducing meat consumption, then completed measures of belief in the arguments, attitudes towards meat, and intentions to reduce meat consumption. All three arguments were effective at producing attitude and intention change, but the ethical argument was the most effective and most believable. Belief in the arguments was a major factor influencing the extent of attitude change. Decreasing belief in the arguments over time indicated participants reacted defensively in response to multiple arguments.

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It was a sunny day in Christchurch, and one of my friends was marching with the Occupy Christchurch movement. A bystander angered by the protest yelled, “get a job,” to which my friend replied, “I have one.” The brilliant reply from the bystander was “no you don't!”(personal communication, 2011). Later a man walked into the Occupy camp and started smashing signs and threatening people with a stick. While waiting for the police to arrive a young female protester asked the (now calmer) man if they could talk about things “person to person.” The man replied, “you're not a person” (personal communication, 2011). In an online discussion about the benefits of washable feminine hygiene products (comfort, health, price, environment, etc.), one woman felt the need to write, “oh my god!!! this is so f-in nasty [sic]” (Ana, 2009). In response to an article asking women to turn off the shower while shaving their legs, one man wrote, “get over it you dumb

hippies. my reaction to a woman with hairy legs or armpits is 'gross' [sic]" (personal communication, 2011). Such reactions are common; many of us have seen bumper stickers that read "save a cow, eat a vegetarian." We may have even reacted in similar ways ourselves, be honest, did the thought of reusable feminine hygiene products make you a little uncomfortable? Though there is much research on defense mechanisms (e.g. Baumeister, Dale & Sommer, 1998; Cramer, 2000; Hart & Chmiel, 1992; de Hoog, Stroebe & de Wit, 2005; Liberman & Chaiken, 1992; Matsuba & Walker, 1998) there is very little research on defense mechanisms in the face of activism. Yet as protests increasingly go global it is an area of considerable value.

Why would people react to activism with defense mechanisms? Activists (intentionally or otherwise) often imply that our actions are immoral in some way, or that the status quo is likely to result in some sort of impending doom. Environmental activists, for example, carry the implication that not only is climate change real, but extremely serious. Climate change has some rather anxiety-provoking consequences: frequent severe storms, complete inundation of some of the small Pacific island nations, and a rate of species extinction that is currently higher than it has been since the end of the Cretaceous Period (when the dinosaurs became extinct). If defense mechanisms protect against anxiety or discomfort (DuNann Winter & Koger, 2010; Funder, 2004), then it is hardly surprising that activists should provoke defense mechanisms. On the other hand, most people think of themselves as good people, and good people do not trash the planet or cause mass species extinctions, yet we are undeniably each part of the cause of climate change. If defense mechanisms are meant to preserve self esteem (Baumeister, Dale & Sommer, 1998), then when confronted by activists whose ideologies threaten one's self concept, defense mechanisms are likely to result.

Though the examples above are clearly defensive, the majority of potentially defensive reactions are much subtler. Denial appears to be the most common reaction to activism. On an individual level, scepticism or disagreement with a statement can appear quite similar to denial or rationalization.

For example, a person might argue that she does not use fluorescent light bulbs because they take a little time to reach their full brightness, but unless she needs to run at full tilt across a room the instant the light turns on, she is likely being defensive. However, if she argues that she does not use them because they give her migraines, or because their high mercury content is damaging in areas without proper disposal facilities, this is not a defensive reaction. A useful distinction is that sceptics examine the evidence carefully and follow where it leads, changing their attitudes accordingly, whereas deniers simply deny the validity of the argument indefinitely (Shermer, 2010). DuNann Winter and Koger also make a useful observation: "When denial is used as a defense, there is a subtext of frustration or hostility" (2010, p. 76). Thus even on an individual level we can sometimes tell the difference between denial and scepticism.

Defense mechanisms are easier to detect on a population level. If reactions to activism show distinctive patterns across a sample, such decreasing in agreement with an issue over time, or decelerating attitude change, that are not attributable to another cause, this would indicate defensiveness. Though mild and short-lived defense mechanisms are an adaptive response to anxiety-provoking information, if the defenses negatively affect quality of life or have the potential to affect it in future, and do not resolve within a reasonable amount of time, then the defenses should be considered maladaptive. Therefore, given that climate change is likely to have a considerable impact on our quality of life in the future (and in some areas already has), continued denial of the existence of anthropogenic climate change is maladaptive and should be treated. This may seem an extreme statement given the popular misinformation about climate change, however the science behind the theory of the greenhouse effect is quite clear, and there are many easy to understand, reliable resources available on the internet.

Recent research in Environmental psychology and related fields is creating a wealth of information on conducting successful attitude and behaviour change campaigns. Unfortunately, this information

rarely disseminates as far as practitioners and activists. A handful of books have been written for practitioners on techniques to promote behaviour change in a target population (e.g. McKenzie-Mohr & Smith, 1999; Thaler & Sunstein, 2009), and several enterprising people have created businesses to teach people psychological technique to promote environmental behaviour (Cotter, 2012; McKenzie-Mohr, 2010; Natural Step, 2012). Unfortunately though, despite repeated recommendations to avoid the use of information-only campaigns, they continue to dominate the field of pro-environment behaviour change. Information-only campaigns may persist in the face of evidence against their effectiveness due to the ease and low cost of running them, and the intuitive reasoning that if you explain to a person why he should not do X, then he is less likely to do X. The intuitive appeal of information campaigns is evident when psychologists assume that merely informing practitioners of the ineffectiveness of information-only campaigns will be sufficient to cause the practitioners to change their behaviour. The continued prevalence of information-only campaigns suggests that rather than continuing to insist that they are less effective, psychologists should investigate ways to make them more effective. Websites are a popular tool for activists and government officials, so it is useful to investigate whether an information-only paradigm is effective via the web.

For decades Environmental psychologists have designed and implemented interventions to increase sustainable behaviours. In an effort to choose behaviours that are easy to change, psychologists have tended to focus on low-impact environmental behaviours (cf. McKenzie-Mohr & Smith, 1999; Steg & Vlek, 2009), such as installing compact fluorescent light bulbs, reusing shopping bags, and raising the blades on lawn mowers. While it is worthwhile intervening in low-impact behaviours, the environmental benefits of the field would increase dramatically if higher-impact behaviours were chosen. There is a belief that high-impact behaviours are hard to change, and low-impact ones easy (c.f. McKenzie-Mohr & Smith, 1999), but this is a false dichotomy. It can be equally hard to convince people to engage in low-impact behaviours (refraining from using modern personal

hygiene products) and high-impact behaviours (using sustainable modes of transport). Some high impact behaviours, however, (washing clothes in cold water, limiting your reproduction) are relatively easy to implement in developed nations. If psychologists make the effort to find easy-to-change higher-impact behaviours, then the field could make an appreciable improvement for our environment.

Meat consumption has one of the highest environmental impacts of any behaviour (Steinfeld et al., 2006). Meat production creates 18% of global greenhouse gas emissions (more than transport), and is a primary contributor to water pollution (Hall, Leavitt, Quinlan, Dixit & Smol, 1999; Unwin, Snelder, Booker, Ballantine & Lessard, 2010; Steinfeld et al., 2006; Verburg, Hamill, Unwin & Abell, 2010). Though improved management of this sector can greatly reduce its impacts (Steinfeld et al., 2006), by far the most effective and immediate reductions can be achieved simply by consuming less meat. If every omnivore in developed nations ate one more vegetarian or vegan meal each week, emissions and other impacts of meat production could be reduced by nearly 15%.

Conversely, reducing meat consumption has relatively few barriers. Barriers are obstructions to the target behaviour, such as lack of time or ability to perform the behaviour, and should be investigated before undertaking any behaviour change program (McKenzie-Mohr & Smith, 1999). Informing a campaign with a barrier analysis decreases the likelihood that common barriers will prevent participants from achieving the desired behaviour change. The barriers to reducing meat consumption include lack of familiarity with vegetarian protein sources (Hoek, Luning, Weijzen, Engels, 2011; Lea & Worsley, 2008), but these should be relatively minor, as people are more inclined to eat novel plant-based foods than novel meats (Pliner & Pelchat, 1991). This suggests that any attempt to reduce meat consumption should include advice on preparing low-meat/vegetarian meals with recognisably plant-based protein sources such as beans. Another

potential barrier is the dietary preferences of others in the household (Hoek et al., 2011; Larsson et al., 2003). In a very small sample of vegans, Larsson et al. (2003) found that young people were more inclined to become vegetarians once they left home and had greater control over their food choices. Household preference barriers could be reduced by including smaller amounts of meat in several meals (rather than no meat in one meal), and should be less of a problem for people looking to reduce their meat consumption (as in this experiment) than for people trying to become vegetarian. The research did not turn up many barriers to reducing meat consumption, and those present should be manageable by instructing participants in how to avoid them. This makes meat consumption a good candidate for an information campaign.

The literature contains two theories which could give an appropriate framework for this experiment: Value-Belief-Norm Theory (VBN; Stern, 2000), and the Theory of Planned Behaviour (TPB; Ajzen 2002; 2005). Though it is widely used in the literature, VBN Theory relies on moral and altruistic values to explain pro-environmental behaviour, and does not account for people engaging in pro-environmental behaviours for more individualistic reasons, such as health. The TPB accounts for many motivations within the attitude heading, including affective (Ajzen, 2005) and moral considerations (Kaiser & Scheuthle, 2003). Intentions in the TPB have been recently found to account for 95% of conservation behaviour, and personal norms in VBN theory only 64% (Kaiser, Hübner, & Bogner, 2005). I will therefore use the TPB as the theoretical framework for this experiment.

The TPB posits that behaviour is determined by intention to perform the behaviour and control over the behaviour (Ajzen, 2006; Ajzen & Albarracín, 2010). Intentions in turn are influenced by the combination of attitude towards the behaviour, social norms concerning the behaviour, and perceptions about the amount of control a person has over the behaviour (perceived behaviour

control; Ajzen 2002; 2005; 2006; Ajzen & Albarracín, 2010). Therefore the TPB presents three targets when designing a behavioural intervention; attitudes, social norms, and perceived behaviour control (PBC). PBC is essentially the inverse of barriers to behaviour.

Providing people with information about a problem should largely affect attitudes unless the information is specifically targeted at making social norms salient or increasing PBC. This is a likely cause of the failure of many informational interventions to produce meaningful behaviour change because only one aspect (attitudes, not social norms or perceived behaviour control) of behaviour change has been addressed. If a particular behaviour is best predicted by social norms or PBC, influencing attitudes will have little effect on behaviour. McCarthy, O'Reilly, Cotter and de Boer (2004) noted that attitudes were a better predictor of meat consumption than subjective norm, therefore attitudes are an appropriate focus for an intervention in this case. PBC will be targeted as well by addressing the barriers outlined above.

Information about the health risks or moral concerns of meat consumption has previously been effective at changing attitudes (Berndsen & Van der Pligt, 2005). In discussions about food choices, outspoken vegetarians and vegans will often present multiple arguments for a vegetarian/vegan diet in quick succession, however anecdotal evidence suggests this often makes the targets defensive, and may cause them to avoid vegetarians or deny the validity of their arguments. Conversely, Berndsen and Van der Pligt (2005) found that attitudes towards meat consumption became less pro-meat over time when participants had the opportunity to reflect upon them. Further anecdotal evidence also suggests that gentle persuasion, modelling, and social norms over the course of several years are likely to transform a meat-eater into a meat-avoider, and may even be potent enough to induce the target to do a masters thesis on reductions in meat consumption. I hypothesize therefore that arguments against meat consumption will initially change attitudes and intentions to

consume meat, but will also induce a saturation effect whereby after a point additional arguments will cease to change attitudes, and in some cases may even start to reverse attitudes.

Three arguments for reducing meat consumption are prevalent both in the literature and in activism. Possibly the most common, and the favourite of vegetarians and People for the Ethical Treatment of Animals (PETA) is the ethical argument, whereby they argue that it is immoral to harm animals while raising them for meat and by killing them for meat (cf. Berndsen & Van der Pligt 2005). Another common argument, outlined above, is that conventional meat production is very harmful to the environment (c.f. Berndsen & Van der Pligt, 2004; Steinfeld et al., 2006). A final argument is that a vegan diet is healthier, and therefore by association a low-meat diet is also healthier. This is the focus of the fad diet, Skinny Bitch (Freedman & Barnouin, 2005) and a controversial new PETA advertisement (PETA claim a vegan diet will increase men's virility; 2012). The health argument is also supported by the American Dietetic Association and the Dietitians of Canada (2003). I should note that most of the arguments that apply to reducing meat consumption apply to all animal products; raising cows for meat or dairy makes little difference to the environment or their welfare (dairy cows are also killed after only a few years), however for the sake of simplicity, I will focus only on meat consumption. There are many other arguments in favour of reducing meat consumption, but this is meant to be a paper on the effects of activism, not activism itself.

Meat consumption is associated with a more affective than cognitive attitude (Aikman, Crites and Fabrigar, 2006; Berndsen & Van der Pligt, 2005) as vegetarians often cite taste and ethics for their dietary choices (Hoek et al., 2011; Povey, et al., 2001; Stockburger, et al., 2009). For this reason, I expect the ethical argument to produce the most attitude and intention change. Previous research has shown that people are more motivated to perform actions if they have a vested interest in the outcome (for review see Ajzen, 2005). In a recent study, Scrimgeour and Helton (in press) found

that sustainable transport use was associated, not with greater environmental awareness, but with a greater belief in the health benefits of cycling, walking, carpooling or bussing. Therefore, I expect the health argument to be next most effective, followed by the environmental one.

To sum, the first hypothesis is that information will be successful at changing attitudes and intentions to consume meat, but successive arguments will decrease in effectiveness over time, and may even eventually reverse their effects such that participants' attitudes start to become more pro-meat and participants indicate an intention to consume more meat. A related hypothesis is that measures of belief in the argument will decrease over time, exhibiting an increase in defensiveness. The next hypothesis is that the ethical argument should be the most effective at producing behaviour change, followed by the health argument, then the environmental one. I will also explore the data with regression analyses to determine if any variables predict attitude and intention changes toward meat consumption.

Method

Participants performed the experiment online using Qualtrics. They completed demographic questions, the Moral Judgement Test (MJT; Lind, 2008, 2009), baseline measurements of meat consumption, attitudes towards meat, and intentions to change meat consumption in the future. They then saw either an environmental, health, or ethical argument against consuming meat, and responded to the argument with questions about belief in the argument, attitude, and intention change. The argument presentation and response was completed two more times such that each participant read and responded to all three arguments, but in a counterbalanced order to minimize order effects.

The questionnaire was administered online for several reasons. Online questionnaires allow the researcher to skip the data transcription step, because data files are downloaded from the internet, thus saving time and limiting errors. They also allow easier dissemination to an international sample, and increase ease of participation which increases participant numbers (cf. Wright, 2005). Participant recruitment can also be very fast. In this case, recruiting over 400 participants and running the experiment took less than a week. Aside from minor sampling issues (under-representation of elderly and low income populations), web-based surveys have no limitations that do not also exist for mailed surveys (Riva, Teruzzi & Anolli, 2003; Wright, 2005). The ease of collecting data online and the large participant numbers available was an acceptable trade-off for selecting this procedure.

Participants

The sample of convenience was recruited using the university Psychology and Geography mailing lists, as well as by “snowballing” through email and social media. In the snowball technique,

participants themselves recruit their friends and family into the study. This technique does not provide a true random sample, but does provide a more diverse range of participants than simply relying on undergraduate psychology students. Participants *(n=363, female = 68%)* were adults *(mean age = 27.83, SD = 13.67)*. The eldest participant in the current study was 96 years old, and the next eldest was 84, so despite sampling concerns with web-based research, elderly people in this experiment seem to be better represented than in the majority of university-based psychology experiments. The sample was reasonably well educated: 1.1% did not graduate from high school, 54.1% had completed high school, 33.9% had completed a tertiary qualification, and 10.9% had completed at least one post-graduate qualification. Vegetarians comprised 10.4% of the sample, which is consistent with population averages in developed Western nations. Most participants were currently living in New Zealand (76.8%) or Canada (19.6%), with the remaining 3.6% in the United States, Australia, Argentina, Germany, UK, Singapore and Sweden.

Some participants discontinued before completion; 434 participants started the questionnaire, but 71 dropped out before starting the experimental section. This could have been due to technical problems, boredom, or interruptions. It is easier to close a browser window on an anonymous online study than it is to get up and walk out of an experiment when the researcher is present. Though the survey software allowed people to save their responses to finish later, not all participants noticed or took advantage of the function. None the less, of the 363 participants who started the *experimental* section of the questionnaire (viewing and responding to the arguments), only 10 dropped out before finishing it. For these participants, an intention to treat paradigm was used; participants were assumed not to have changed over time, thus in any time-based analyses, responses to the previous questions were used to fill in missing responses to subsequent questions. A logistic regression analysis of participant drop outs on MJT score, age, gender, education, meat consumption, social norm, attitudes, PBC, and ambivalence was significant, *Cox & Snell* $R^2 = .05$, $\chi^2 (8) = 16.72$, $p < .05$. Participants were more likely to drop out who had more pro-meat attitudes *(B = .72, p = .05)*,

and high ambivalence towards meat *(B = .78, p < .05)*. Implications are included in the discussion.

Arguments

Participants viewed three arguments were presented, outlining respectively environmental, health, and ethical arguments for reducing meat consumption. Though the content of the arguments necessarily differed, the formatting was the same for all three (cf. Obermiller, 1995). Following each argument was an identical paragraph designed to increase self-efficacy with tips on plant-based protein sources. Because most participants were expected to be from Canada or New Zealand, the arguments were framed for these audiences. The arguments were evaluated for their Flesch-Kincaid grade level and reading ease using an online tool (Child, n.d.), and adjusted so their difficulty was as similar as possible. The environmental argument had a reading ease of 35.8 (range: 0 – 100, higher is easier to read), and a grade level of 16; health had a reading ease of 36.7 and a grade level of 14.2; and ethical had a reading ease of 55.7 and a grade level of 10.9. Though not perfect, the scores indicate that the arguments were roughly similar in reading difficulty.

Environmental. The environmental argument was based mainly on the report by the Food and Agriculture Organization of the United Nations (UN FAO). The citation, UN FAO (2006), actually refers to Steinfeld et al. (2006). UN FAO was used as the citation in the argument because a reference list was unavailable to participants, and a citation from the UN was likely to be more meaningful than the primary author. The other citations were written according to convention because the organizations that produced the reports were unlikely to be recognized by an international sample. The argument against eating meat was as follows:

> Eating too much meat causes problems for the environment according to the Food and Agriculture Organization of the United Nations (UN FAO, 2006). Meat production produces 18% of global greenhouse gas emissions; more than the entire transport sector

(UN FAO, 2006). The Amazon rainforest is being cut down to graze animals – 70% of the deforested land is now used for grazing, in addition to large amounts of land being used to grow animal feed (UN FAO, 2006). Meat production is also one of the biggest causes of species extinctions because of ecosystems being destroyed for pasture and grain production, degraded pasture from over-grazing, and contributions to climate change (UN FAO, 2006). Factory farming and grazing animals are leading causes of water pollution in New Zealand and Canada (Hall, Leavitt, Quinlan, Dixit & Smol, 1999; Unwin, Snelder, Booker, Ballantine & Lessard, 2010; Verburg, Hamill, Unwin & Abell, 2010). Technological advances and better management can reduce the environmental impacts of meat production (UN FAO, 2006), but by far the most effective and immediate improvements can be achieved simply by consuming less meat. If every omnivore in developed nations ate at least one more vegetarian or vegan meal each week, emissions and other impacts of meat production could be reduced by nearly 15% in just a few months.

Health. The health argument against eating meat was as follows:

Eating too much meat causes problems for your health according to a recent review by Fraser (2009), the American Dietetic Association and the Dietitians of Canada (2003). Vegetarians have a lower risk for heart disease, obesity, colon and prostate cancer, diabetes, high cholesterol, and hypertension than omnivores (American Dietetic Association, 2003; Fraser, 2009). Animal products are high in unhealthy saturated fats, which should be avoided to maintain a healthy weight (Health Canada, 2007; New Zealand Ministry of Health [MOH], 2005; World Health Organization, n.d.), and are not necessary for a healthy diet as long as a variety of pulses (legumes; beans, dried peas, lentils), nuts, seeds, whole-grains, fruits and vegetables are consumed (American Dietetic Association, 2003; MOH, 2005). Health Canada (2007) recommends frequently

> replacing meat with pulses (legumes) and tofu. A diet rich in whole-grains, beans, lentils, nuts, seeds, leafy greens and vitamin C will contain adequate protein and iron (MOH, 2005). In addition, vegetarian diets are often lower in saturated fats and cholesterol than omnivorous diets, and are higher in fibre, vitamins C and E, and other essential nutrients (American Dietetic Association, 2003). As a result, reducing meat consumption by at least one meal per week should help a person to lose weight and reduce the risks for a wide range of deadly diseases.

Ethical. In my opinion it is impossible to legally research the living conditions of factory farmed animals without first gaining employment in the meat industry. The standard conditions are not publicised, probably because the industry knows that they would discourage people from eating meat. Instead, the laws and official publications use the term "industry standard." Farm visits are possible, but access to the entire facility is almost never granted, so visitors see only what farm operators are willing for them to see. Therefore information about living conditions comes from activists who have usually obtained the information illegally. In the interest of fairness, and to avoid traumatising participants, I assumed the information obtained was biased, and I did not report the worst animal rights infractions. I would like to note however, that researchers should be careful of their own mental status when doing investigations of this kind, because the evidence of animal cruelty you are likely to see is truly horrific. If, like me, you do eat some meat, it can be very difficult to work on a report if your unconscious is trying to repress it. The argument shown to participants is as follows:

> Eating too much meat causes problems for the ethical treatment of farm animals. To meet a growing consumer demand, in New Zealand pigs and poultry (chickens, turkeys) are often raised in factory farms (Ministry of Agriculture and Farming, 2009). Over 90% of all meat produced in Canada comes from factory farms (MacLachlan, 2011). Factory farms are industrial meat-production facilities where animals are treated like

step in a production line. The animals are crowded so tightly they can barely move and are denied access to sunlight, fresh air and pasture. The factories are often so full of manure that respiratory problems and other diseases are frequent. These conditions stress the animals and make them more likely to fight, so often poultry have their beaks cut off and pigs are confined to crates so they cannot interact with each other. In New Zealand and Canada pregnant and lactating pigs are commonly confined to tiny crates, so small they cannot move around. If dogs or cats were treated as farm animals are, their owners would be charged with cruelty to animals. Farm animals exhibit behaviours that in a human would be interpreted as fear, stress, pain, despair and sadness. They deserve to be treated with respect, allowed to move freely, and exhibit natural foraging and play behaviours for their short lives. Until laws are changed to protect these animals from needless cruelty, the best thing people can do for them is to refuse to support cruel farming practices by refusing to buy factory farmed meat. Eating beans instead of meat for supper at least once each week will reduce the demand for factory farmed meat and will help to save thousands of animals from needless cruelty.

Plant-based protein sources. This paragraph followed each of the arguments, and thus was seen three times by all participants. It was designed to increase PBC by tackling the barriers outlined in previous research:

Eating less meat doesn't mean you (or your family) have to become vegetarian. You can eat beans, lentils, seeds, nuts or tofu instead of meat at one meal each week, or include them in two meals and eat half the meat you normally would at those meals. Replacing half the meat with a serving of beans at two meals is just as effective as eating one vegetarian meal, and is less likely to leave you feeling hungry later. Vegetarian protein sources like beans, nuts, seeds, lentils, or tofu are easy to add to meals like chilli, soups, stews, curries, salads and stir fries. Any reduction in your meat consumption, no matter

how small, will have a positive effect.

Measures

Questionnaire. The questionnaire consisted of a demographic section, the MJT (Lind, 2008; 2009), baseline measurements of attitudes and behaviour, and an experimental section with three arguments against consuming meat presented in a counterbalanced order. The experiment was designed for both Canadians and New Zealanders, but in such a way as it could be completed by anyone who reads English. The full questionnaire is available in appendix A.

In accordance with the procedures of Hoek et al., (2011), and Lea and Worsley (2008), demographic variables were measured including age, gender, education level. Since the source of meat in each country varies, and therefore so does its environmental impacts, health implications, and ethical considerations, country of residence was also asked. Hoek et al. (2011) measured the number of children in the household, however our sample consisted largely of childless university students, who, in Canada and New Zealand, vary on whether they share meals as a household, so rather than ask about children, or household members, I asked about the number of people with whom they regularly shared meals, and whether those people had any dietary restrictions.

The MJT (Lind, 2008; 2009) assess participants' ability to judge the validity of an argument, regardless of their personal position on the issue. In accordance with Lind's instructions, the MJT was inserted into the questionnaire directly after demographic measurements.

The definition for "meat" was modified slightly from Hoek et al. (2011) to read:

The term meat refers to all meat products eaten, varying from steak and schnitzel to

> cubes of ham, pieces of bacon or minced or ground meat in sauces. It also includes cold meat products used for sandwiches such as salami or ham. Meat also includes wild game and poultry such as chicken or turkey, but for the purposes of this survey does not include fish or eggs.

Following Berndsen and Van der Pligt's recommendations (2004), meat consumption was measured with *'on average, how often do you eat meat with your* 'evening' *meal?'* Participants indicated whether they ate meat *'never or nearly never, less than once a week, once or twice, three or four times, five or six times, or daily'* then indicated how much they normally ate by selecting one of '*an amount smaller than a deck of cards (less than 75g), about the size of One deck of cards (75 – 150g), about the size of Two decks of cards (151 – 225g), about the size of Three decks of cards (226 – 300g), More than Three decks of cards (more than 300g).'* The deck of cards analogy is a portion control aid commonly used by Weight Watchers, and is therefore familiar to many people; it was used to increase the accuracy of portion estimates. These two questions were repeated for the *'mid day'* and *'morning'* meal. The meals were referred to by time of day because New Zealanders have 'tea', at the same hour as Canadians have 'supper,' which is more commonly referred to by Canadians as 'dinner', but in some countries 'dinner' refers to 'lunch'. Participants who reported eating no meat were allowed to skip the questions measuring meat consumption.

Ambivalence is usually defined as the presence of variance in a person's attitude towards an object (Sparks, Conner, James, Shepherd, & Povey, 2001). It can be conceptualised as the presence of concurrent conflicting attitudes, e.g. "red meat is high in iron" and "red meat is associated with heart disease and cancer," or as attitudes conflicting along a temporal continuum (Sparks et al., 2001), constituting a self-control problem; "I want cake because it tastes good, but if I eat it I won't fit into my wedding dress." Ambivalence can have either a mediating effect (Berndsen & Van der Pligt, 2004), or a moderating effect (Sparks et al., 2001) on the relationship between attitudes and meat consumption. I measured it with three questions, simplified from Priester and Petty (1996): *'I*

feel conflicted about eating meat', 'I feel indecisive towards the issue of eating meat' and *'I have completely clear reactions towards the issue of eating meat.'* Meat eaters report dramatically more ambivalence towards eating meat than vegetarians do to their own diets (Berndsen & Van der Pligt, unpublished pilot, 2001; cited in Berndsen & Van der Pligt 2004; Povey, Wellens & Connor, 2001). Ambivalence towards eating meat affects meat consumption both independently (by making attitudes easier to change), and through a mediating effect on attitudes towards meat consumption (Berndsen & Van der Pligt, 2004).

Beliefs about the arguments presented were measured with the same questions as Berndsen and Van der Pligt (2004) used for a manipulation check: *'How much did the information convince you?', 'Do you agree with the content?', 'How informative was it for you?'*. I also asked *'Did the last paragraph [about plant-based proteins] help you feel more able to eat less meat', 'How truthful did the argument seem?'* and *'How much of the information was new to you?'* All the measures of belief correlated strongly with each other, with the exception of *'how much of the information was new to you?'* (see table 1). Since the pattern of correlations were very similar at times one, two and three, only time one is shown in table 1. Both the Eigenvalues and the scree plot of a principal component analysis returned two components. An unrotated factor analysis with two factors extracted showed that all questions except *'how much of the information was new to you?'* loaded most strongly on the first factor (see table 2), therefore that question was removed from subsequent analyses. Factors one and two together explained 52.07% of the total variance. The resulting measure, belief in the argument is intended to be used as a proxy measure for denial. The question of whether it truly measures denial is a difficult one. Many self-report measures of defense mechanisms have been developed, however they have all been found to have problems with reliability (Cramer, 2000). Defense mechanisms by definition are unconscious reactions, and therefore only the symptoms (such as denial of the validity of an argument) can be measured. Many self-report personality scales in reality measure defense mechanisms (see Cramer, 2000), and I believe that asking participants

how much they believe in the transparent argument I presented them should in fact measure defensiveness (nothing said in any of the arguments was known to be untrue). Thus I believe this approach to be a reasonable measure of defense mechanisms and coping strategies

Table 1:
Correlations of measures of beliefs in the argument at time one

Variable	Agreement	Informative	Helped with PBC	Truthfulness	Novelty
Convincingness	.56***	.46***	.58***	0.45***	0.13*
Agreement		.36***	.40***	.62***	-.15**
Informative			.38***	.34***	.38***
Helped with PBC				.36***	.14**
Truthfulness					-.07

** p < .05*
*** p < .01*
**** p < .001*

Table 2:
Component matrix of belief questions

	Component	
	1	2
Convincingness	.827	.036
Agreement	.777	-.401
Informative	.679	.449
Helped with PBC	.729	.110
Truthfulness	.726	-.342
Novelty	.161	.901

The Theory of Planned Behavior. According to Ajzen's Theory of Planned Behavior (1991, 2005; Ajzen & Albarracín 2010), attitudes, social norms, and PBC combine to influence intentions about whether or not to perform a specific behaviour. As long as unforeseen barriers do not get in the way, the individual is likely to follow through on that intention and perform the behaviour. Questions about participants' attitudes, social norms, and perceived behaviour control towards meat were carefully balanced (pro and anti meat) to avoid alienating participants or

indicating preference for one answer or another.

Participants indicated their attitudes towards eating meat on a five point scale using Berndsen and Van der Pligt's (2004) semantic variables, '*bad/good*', '*unpleasant/pleasant*', '*against/for*', '*unfavourable/favourable*', '*negative/positive*', in addition to '*eco/un-eco*', '*healthy/unhealthy*', '*moral/immoral*'. The correlation matrix of all the attitudinal variables showed that all were highly correlated, and the pattern of correlations was similar across baseline and times one through three, so only the correlations from time one are shown in table 3. A scree plot from a principal component analysis clearly showed only one component. This component accounted for 73.91% of the variance. An unrotated factor analysis with a single factor extracted showed all variables loading on the single factor.

Table 3:
Correlation matrix of attitudinal variables at time one

Semantic Attitude Variables	Bad / Good	Unpleasant / Pleasant	Against / For	Unfavourable / Favourable	Negative / Positive	Un-eco / eco	Unhealthy / Healthy
Bad / Good							
Unpleasant / Pleasant	.78*						
Against / For	.89*	.67*					
Unfavourable / Favourable	.87*	.81*	.90*				
Negative / Positive	.89*	.75*	.89*	.90*			
Un-eco / eco	.69*	.55*	.68*	.70*	.69*		
Unhealthy / Healthy	.70*	.61*	.69*	.70*	.69*	.62*	
Immoral / Moral	.76*	.64*	.77*	.77*	.77*	.71*	.63*

** $p < .001$*

Social norms have (at least) two distinct conceptualisations in the literature. Hoek et al. measured them with "*my fellow household members don't like to eat these products*" (2011, p. 666), whereas

Berndsen and Van der Pligt, used the more traditional two-factor approach for the Theory of Planned Behaviour: "'*people who are important to me think that I should eat meat*'... [and] '*how much do you want to do what these important people think you should?*'" (2004, p.74). Hoek's approach appears to straddle the boundary between PBC and social norms, so Bernsden and Van der Plight's two question method was used. The question was asked two ways; '*people who are important to me think that I should eat less [more] meat*'. For simplicity the second half of the question was rewritten: '*I want to do what these people want me to do*'.

PBC was measured by asking participants about their abilities to eat more or less meat: '*if I wanted to eat more [less] meat I could overcome any obstacles in my path*', '*I know how or can easily learn how to cook meatless main courses [main courses containing meat]*', and '*if I wanted to I could...reduce [increase] my meat consumption / cook more [fewer] meals containing meat*'. The questions were balanced this way to reduce reactions to vegetarianism.

Intentions were measured with the question '*in the future, do you intend to... eat more / the same amount / less meat*', similarly to the method used by Berndsen and Van der Pligt (2004). Though intentions are at best a poor proxy for behaviour, they are important in the environmental literature because they represent a willingness to take ownership of a problem which is a "commons dilemma" (see Gifford, 2007). Often environmental solutions are framed as things "other people" should do; closing coal power plants, reducing agrichemicals, stopping whaling, etc. Without risking arrest, the average person has very little direct influence on any of these actions. One of the most frequent statements I hear when discussing sustainable forms of transport (walking, cycling, bussing, carpooling, motorcycling) is "yes, but *I* need my car because..." as if the person I'm talking to has rare needs or responsibilities that other people don't have. To be fair, a few people do have rare needs or responsibilities which preclude ever using sustainable transport, Queen Elizabeth II for example, but most do not. While I appreciate that there are many real barriers to sustainable

transport, it is up to individuals to take responsibility for their own actions whenever possible. In this manner even actions that could be performed by individuals are often dismissed as something that “other people” should do. Therefore an indication of willingness to change one's own behaviour is important.

Thus to sum, participants filled in a questionnaire consisting of demographics, the MJT, and baseline measures of meat consumption, attitudes towards meat consumption, and intentions to consume meat in future. They then viewed three arguments against meat consumption and answered questions about their belief in the argument, attitudes, and intentions after each argument. The questions were balanced to have equal numbers pro- and anti-meat to avoid influencing participants, and the argument presentation order was counterbalanced to minimise order effects.

Results

Changes over time

The first order of business was to test the hypothesis that the arguments had a negative effect on attitudes towards meat and intentions to consume meat. Sphericity was violated both for attitudes $W = .49, \chi^2 (5) = 230.28, p < .001$, and intentions, $W = .65, \chi 2 (5) = 138.92, p < .001$, however unless the Greenhouse-Geisser correction changed the significance, the uncorrected results are reported below. Repeated measures ANOVAs showed that attitudes towards meat *decreased* over time, $F (3, 1002) = 81.31, p < .001$ (see figure 1), and as hypothesised, participants changed their intentions to eat *less* meat over time, $F (3, 1002) = 10.23, p < .001$ (see figure 2). Gender and condition (order of argument presentation) were entered into the model as between-subjects variables. Men had significantly more favourable attitudes towards meat, $F (1, 334) = 14.53, p < .001$, and intended to consume more of it, $F (1, 334) = 11.67, p = .001$. There was no effect of conditions either for attitudes, $F (5, 334) = .36, p = n.s.$, or intentions, $F (5, 334) = .02, p = n.s.,$ indicating that any order effects were adequately controlled. A significant time x gender interaction indicated that women's attitudes changed more over time than men's (Greenhouse-Geisser corrected) $F (2, 667.71) = 4.68, p = .01,$ (see figure 2), but there was no corresponding time x gender interaction for intentions, $F (3, 1002) = .37, p = n.s$. In the case of intentions, the change appears to be curvilinear, such that change occurs dramatically to the first argument, somewhat to the second, and very little to the third. The change in attitudes also appears to be curvilinear, however it is also possible that changes from the first argument onward are linear. In both the case of attitudes and intentions, if the curve continues, the maximum possible score *(Max intentions = 3, Max attitude = 0)* will never occur.

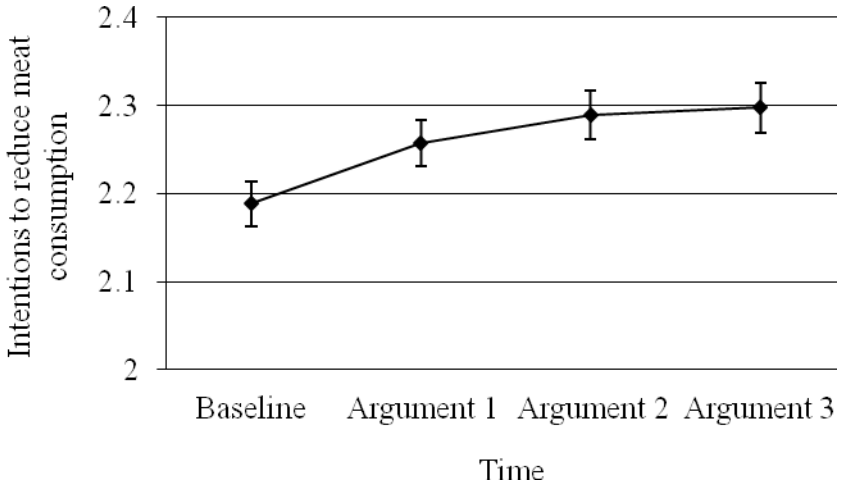

Figure 1: Intentions to reduce meat consumption over time (higher values reflect intentions to reduce meat consumption)

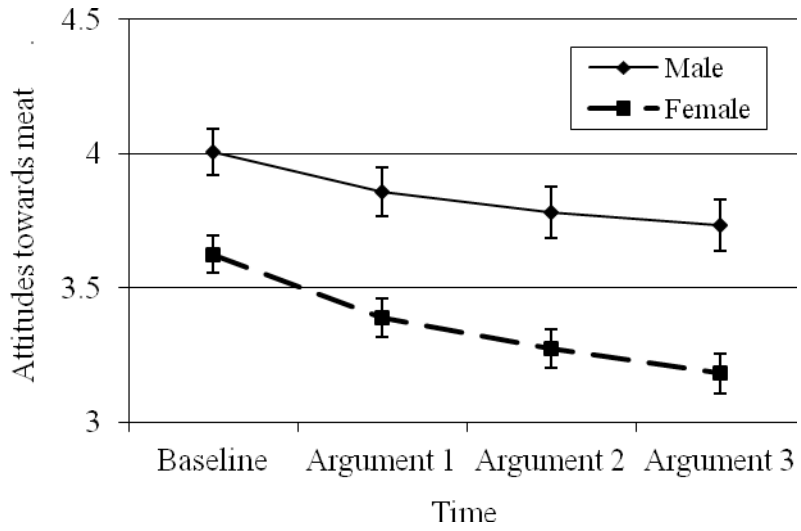

Figure 2: Decreases in attitude over time (higher values reflect more pro-meat attitudes)

Belief in the arguments also decreased significantly over time, $F\ (2, 690) = 3.38, p < .05$. There was not a significant decrease from time one to time two, $t\ (345) = 1.22, p = n.s.$, nor from time two to three, $t\ (345) = 1.46, p = n.s.$, however, there was a significant decrease in belief between time one and three, $t\ (345) = -2.47, p < .05$. The change in belief over time appears to be linear.

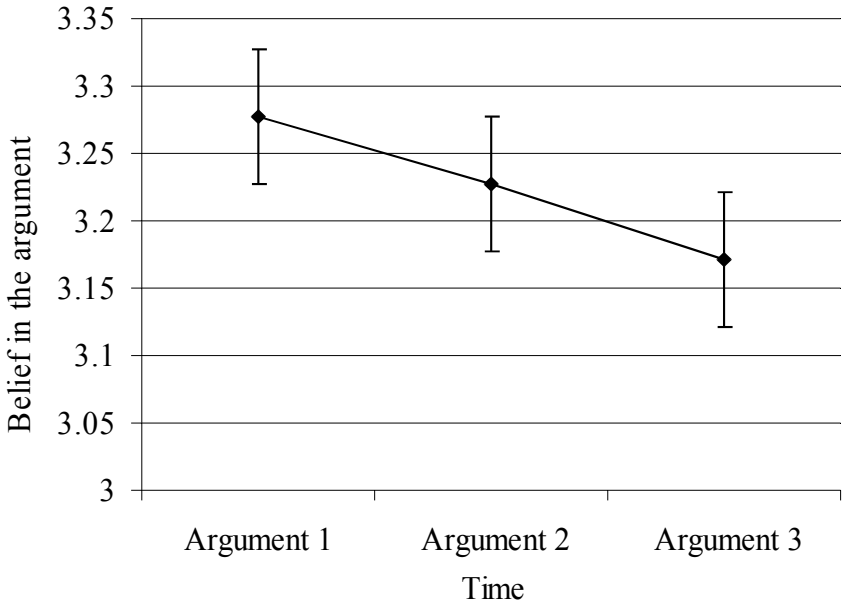

Figure 3: Decreases in belief in the argument over time as a result of viewing arguments against meat consumption (lower values reflect less belief in the argument)

Differential Effectiveness of the Arguments

A second question of interest was whether one argument would prove more or less effective than the others. RM ANOVAs confirmed that attitudes decreased significantly between baseline and at least one of the arguments, $F\ (3, 1005) = 87.70, p < .001$ (see figure 4). Attitudes decreased significantly from baseline after viewing the arguments, each for the environmental, $t\ (335) = 11.13, p < .001\ (d = .62)$, health, $t\ (335) = 10.79, p < .001\ (d = .59)$, and ethical arguments $t\ (335) = 11.81, p < .001\ (d = .65)$. The environmental and health arguments were equally effective at producing attitude change, $t\ (335) = .28, p = n.s\ (d = .00)$, whereas the ethical argument was more effective than both the health $t\ (335) = 2.99, p < .01\ (d = .16)$, and environmental argument, $t\ (335) = 3.50, p < .01\ (d = .18)$. Effect sizes were calculated using Cepeda's (2008) online calculator which corrects for within-subjects data.

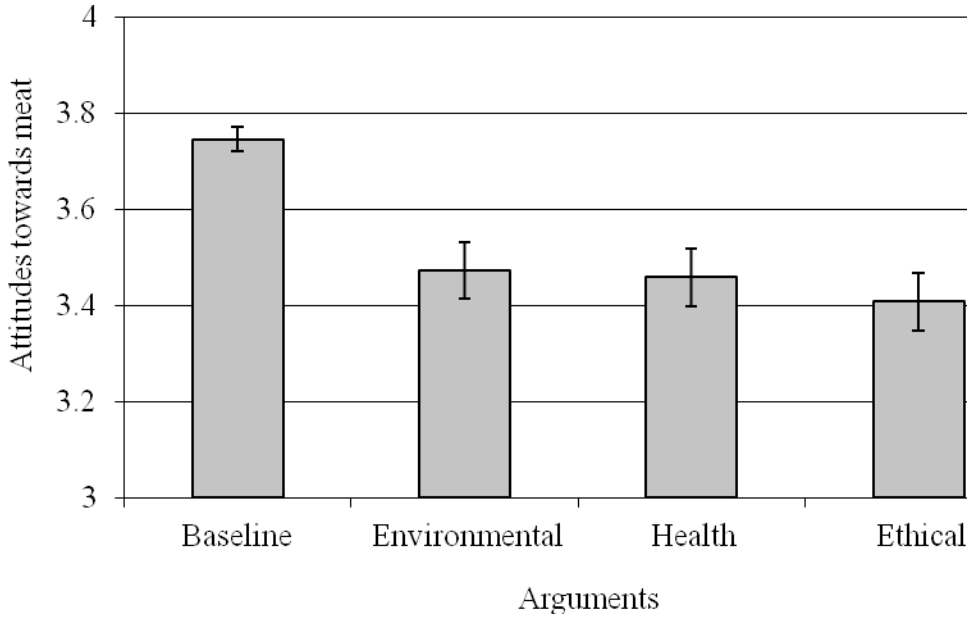

Figure 4: Decreases in attitude as a result of each argument (higher values reflect more pro-meat attitudes)

Intentions to reduce meat consumption also increased significantly from baseline after viewing the arguments, (RM ANOVA) $F\ (3, 1005) = 16.23, p < .001,$ each for the environmental, $t\ (335) = -4.66, p < .001\ (d = .27),$ health, $t\ (335) = 10.79, p < .001\ (d = .59),$ and ethical arguments $t\ (335) = 11.81, p < .001\ (d = .65)$ (see figure 5). Again, the environmental and health arguments were about equally effective at changing intention, $t\ (335) = .93, p = n.s\ (d = .07)$, as were the ethical and environmental arguments, $t\ (335) = 1.71, p = n.s\ (d = .08)$, however the ethical argument was more effective than the health at changing intentions, $t\ (335) = -2.74, p < .01\ (d = .16)$.

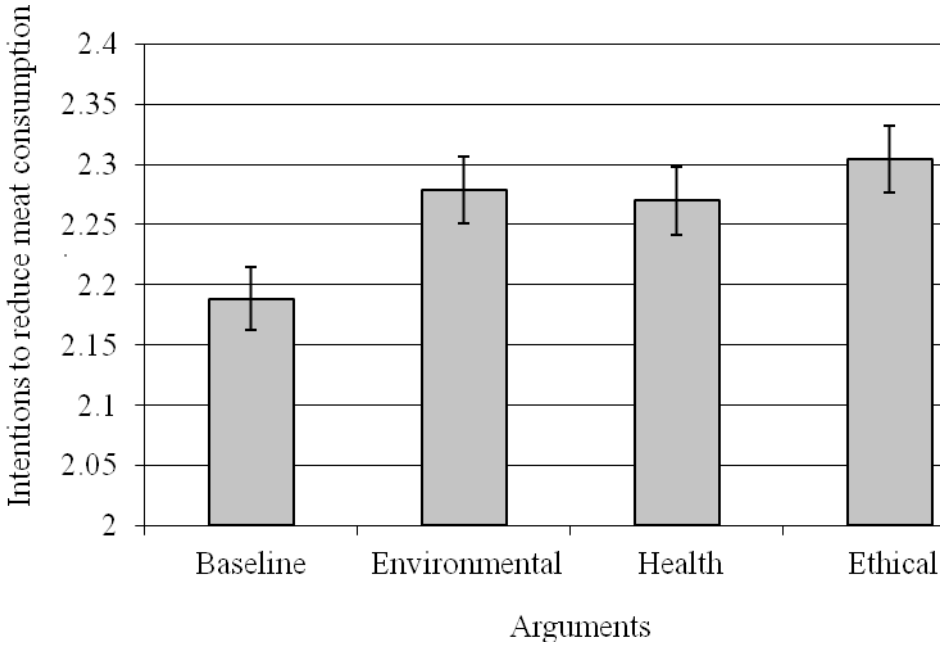

Figure 5: Increase in intentions to reduce meat consumption as a result of each argument

Beliefs in the argument were examined in the same manner. A RM ANOVA showed that the arguments did differ in "believability", $F\ (3, 670) = 14.93, p < .001$ (see figure 6). Participants believed approximately equally in the environmental and ethical arguments, $t\ (335) = 1.25, p = n.s\ (d = .07)$, and less in the health argument than either the environmental, $t\ (335) = -3.21, p < .01\ (d = .18)$, or ethical arguments, $t\ (335) = 5.50, p < .001\ (d = .32)$.

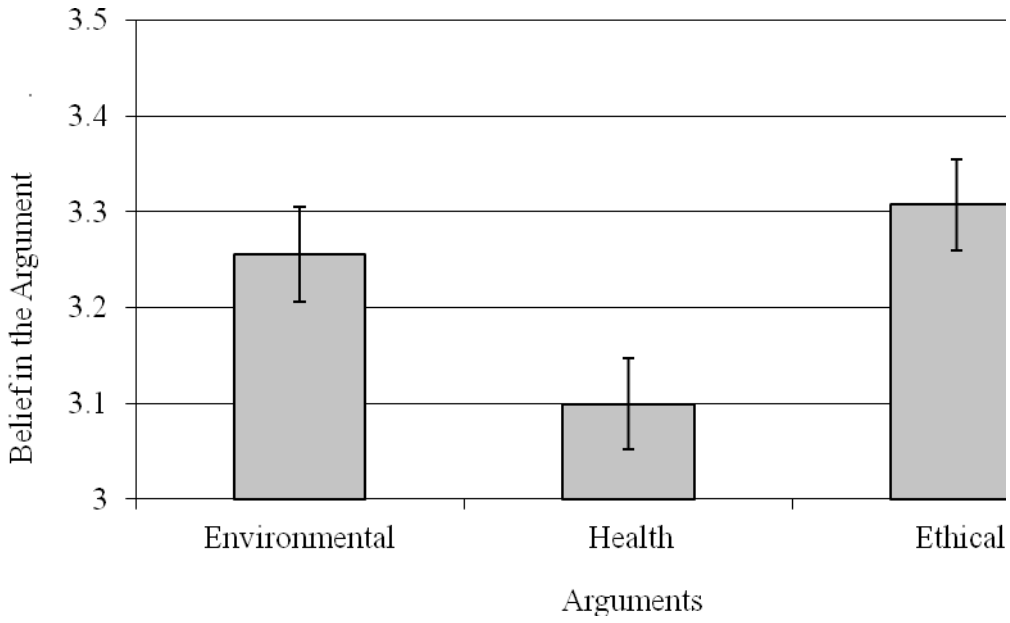

Figure 6: Belief in the different arguments.

To examine whether one argument performed "best" overall, summed outcome measures were generated for each argument from attitudes, intentions, and beliefs. The arguments were significantly different overall, $F\ (2, 670) = 16.48, p < .001$. The ethical argument scored "best" on outcomes measures, followed by the environmental argument, $t\ (335) = -2.63, p < .01\ (d = .14)$, then by health, $t\ (335) = -3.21, p < .01\ (d=.18)$.

Predicting beliefs, attitudes, and intention change

Regression analyses were used to examine predictor variables on belief in the argument, attitudes, and changes in intention to consume meat. Variables were centred (Frazier, Tix & Barron, 2004), then examined for their individual predictive value, and for mediator and moderator effects (see Baron & Kenny, 1986; Frazier, Tix & Barron, 2004).

A regression of belief in the environmental argument (enter method) on baseline attitudes, social norms, PBC, meat consumption, gender, age, education, and ambivalence, $R^2 = .17, F\ (9, 328) = 7.33, p < .001$, revealed that belief in the argument was negatively predicted by age and pro-meat

attitudes (see table 4). Regressing belief in the ethical argument on the same variables, $R^2 = .20$, $F(9, 332) = 9.19$, $p < .001$, also revealed significant negative prediction by pro-meat attitudes and age. Belief in the health argument was regressed likewise, $R^2 = .19$, $F(9, 324) = 8.55$, $p < .001$, but instead was negatively predicted by pro-meat attitude and education (higher education resulted in less belief) (see table 4).

Table 4
Predictors of belief in the arguments

Argument	Predictor variable	B	SE B	β
Environmental				
	Baseline attitude**	-.27	.07	-.33
	Age*	-.01	.00	-.12
	Gender	.13	.10	.07
	Social Norm	.01	.01	.05
	Ambivalence	.03	.05	.04
	Meat consumption	-.01	.04	-.03
	Education	.02	.04	.02
	PBC	-.04	.08	-.02
	MJT score	-.00	.00	-.02
Ethic				
	Baseline attitude**	-.28	.07	-.33
	Age*	-.01	.00	-.14
	Gender	.19	.10	.10
	Education	-.06	.04	-.09
	Ambivalence	.05	.05	.06
	PBC	-.08	.08	-.05
	Social Norm	.01	.01	.03
	MJT score	-.00	.00	-.03
	Meat consumption	.01	.04	.01
Health				
	Baseline attitude**	-.30	.07	-.36
	Education*	-.09	.04	-.13
	Social Norm	.02	.02	.07
	Gender	.19	.10	.05
	Ambivalence	.02	.06	.03
	Meat consumption	-.02	.04	-.03
	MJT score	-.00	.00	-.03
	PBC	-.03	.08	-.02
	Age	.00	.00	.00

Note: enter method
* $p < .05$

*** p < .001*

Dividing participants into old *(n = 115)* and young *(n = 188)* age groups at 23 years (there was a pronounced decrease in frequency at age 23; median age = 22), and removing vegetarians from the analyses revealed that young omnivores found the ethical argument more believable than old omnivores, (see figure 7) *F (1, 304) = 8.50, p < .01.* There was no corresponding difference, between age groups for belief in the environmental, *F (1, 301) = 2.67, p = n.s.,* or health arguments, F *(1, 297) = .47, p = n.s*.

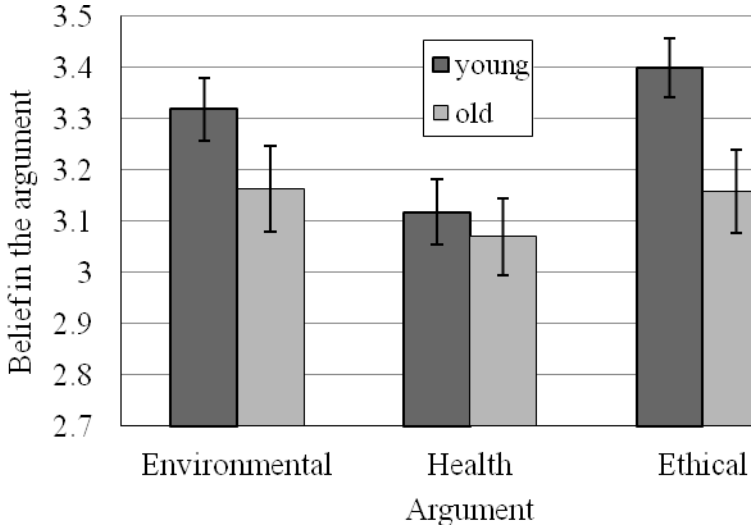

Figure 7: Belief in the different arguments by age of participants.

Because attitudes and intentions were both measured after each argument, it was possible to test which variables predicted post-test attitude and intention change. The predictors of attitudes and intentions were examined using regressions for simple predictive effects, as well as mediator and moderator effects. Ambivalence was examined in an attempt to illuminate and replicate its reported role as a mediator (Berndsen & Van der Pligt, 2004) and moderator (Sparks et al., 2001). Attitudes were tested using four steps, each using the enter method. The first step contained demographic and baseline variables: baseline attitude, social norm, PBC, MJT score, meat consumption, gender, age,

and education. In the second and third steps, belief in the argument and ambivalence were added respectively to test for mediation effects. The fourth step added the following potential moderators of the relationship between baseline attitude and post-argument attitude: ambivalence, gender, MJT score, and beliefs in the argument (see table 5). This process was repeated for the environmental, ethical, and health arguments, however, since the results were essentially the same, only the regression for the environmental argument is shown (see appendix B for the regressions of attitudes after the health and ethical arguments).

Table 5
Predictors of post-environmental argument attitudes

Step	Predictor variable	B	SE B	β	Model R^2	R^2 change
1						
	Baseline attitude***	.95	.03	.92		
	Gender**	-.17	.06	-.07		
	Age*	.00	.00	.05		
	Social Norm	-.02	.01	-.05		
	Meat consumption	-.02	.02	-.04		
	PBC	.03	.04	.01		
	MJT score	.00	.00	.01		
	Education	-.02	.02	-.03	.84***	.84***
2	Belief in environmental argument***	-.23	.03	-.18	.86***	.03***
3	Ambivalence	-.05	.03	-.05	.87***	.00
4	Ambivalence x baseline attitude	-.03	.02	-.03		
	Gender x baseline attitude	-.07	.05	-.12		
	MJT score x baseline attitude	.00	.00	.00		
	Belief in argument x baseline attitude*	-.06	.03	-.05	.87***	.01*

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time. Any significant changes in variables from one step to the next are reported in the text.
* $p < .05$
** $p < .01$
*** $p < .001$

For the all three arguments, pro-meat baseline attitude, male gender, and older age predicted more

positive post-argument attitudes towards meat. Belief in the argument also predicted post-argument attitude, as well as mediated the relationship between age and post-argument attitude, such that when belief was entered into the model, age was no longer significant. No other mediator effects occurred. Belief in the argument also moderated the relationship between baseline attitudes and post-argument attitudes, such that when belief in the argument was low, baseline attitudes predicted post-argument attitudes, but when belief in the argument was high, baseline attitudes were no longer predictive of post-argument attitudes. This same pattern occurred for the environmental and ethical arguments. The only exception occurred in the health regression where belief did not mediate the effect of age on post-argument attitude; age remained a significant predictor when belief was added to the regression (see appendix).

Changes in intentions to consume meat were examined by generating change scores (baseline intention subtracted from post-argument intention). The models were similar to the ones predicting attitudes, with belief in the argument, social norms, MJT score, PBC, meat consumption, gender, education and age in the first step, followed by post-argument attitude and ambivalence in the second and third steps respectively. The fourth step consisted of interactions with post-argument attitudes: ambivalence, MJT score, gender, and baseline attitude. This process was repeated for the environmental (table 5), health (table 6), and ethical (table 7) arguments.

In all cases intention change was predicted by higher meat consumption and greater belief in the argument. Post-argument attitude may also influence intentions to consume meat in tandem with ambivalence because pro-meat attitude was only a significant predictor of intentions (all arguments) when ambivalence was part of the model, but low ambivalence predicted intentions to consume less meat only in response to the health argument (table 6). Ambivalence was not a significant predictor either for the ethical *(p = .07),* or the environmental arguments *(p = .14).*

Table 5
Predictors of intention change in response to the environmental argument

Step	Predictor variable	B	SE B	β	Model R^2	R^2 *change*
1	Beliefs in environmental argument***	.09	.03	.21		
	Meat consumption*	.03	.01	.13		
	Age	-.00	.00	-.09		
	Social Norm	.01	.01	.08		
	Gender	.04	.04	.05		
	PBC	-.01	.04	-.02		
	MJT score	.00	.00	.01		
	Education	.00	.02	.02	.07**	.07**
2	Post-argument attitude	-.05	.03	-.14	.08**	.01
3	Ambivalence	-.04	.02	-.10		
	Post-argument attitude*	-.06	.03	-.18	.09**	.01
4	Ambivalence x post-argument attitude	.04	.02	.10		
	MJT score x post-argument attitude	.00	.00	-.01		
	Gender x post-argument attitude	-.08	.04	-.39		
	Baseline attitude x post-argument attitude	-.01	.02	-.03	.10**	.01

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time unless significant changes occurred.
* $p < .05$
** $p < .01$

Table 6
Predictors of intention change in response to the health argument

Step	Predictor variable	B	SE B	β	Model R^2	R^2 *change*
1	Beliefs in ethical argument***	.09	.02	.22		
	Meat consumption*	.03	.01	.14		
	Age	-.00	.00	-.03		
	Social Norm	.01	.01	.08		
	Gender	.05	.04	.07		
	PBC	-.03	.04	-.05		
	MJT score	.00	.00	-.02		
	Education	.00	.02	.01	.07**	.07**
2	Post-argument attitude	-.04	.03	-.13	.08**	.01
3	Ambivalence*	-.05	.02	-.15		
	Post-argument attitude*	-.08	.03	-.23	.09***	.02*

4	Ambivalence x post-argument attitude	.04	.02	.12		
	MJT score x post-argument attitude	.00	.00	.00		
	Gender x post-argument attitude	-.08	.04	-.44		
	Baseline attitude x post-argument attitude	.00	.02	-.00	.11**	.02

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time unless significant changes occurred.
* $p < .05$
** $p < .01$
*** $p < .001$

Table 7
Predictors of intention change in response to the ethical argument

Step	Predictor variable	B	SE B	β	Model R^2	R^2 *change*
1	Belief in ethical argument**	.09	.03	.20		
	Meat consumption**	.02	.01	.11		
	Social Norm*	.01	.01	.11		
	Age	.00	.00	-.01		
	Gender	.04	.05	.04		
	PBC	-.04	.04	-.06		
	MJT score	.00	.00	-.01		
	Education	-.01	.02	-.03	.07**	.07**
2	Post-argument attitude	-.04	.03	-.12		
	Social Norm	.02	.01	.10	.08**	.01
3	Ambivalence	-.05	.02	-.15		
	Post-argument attitude**	-.04	.03	-.12	.09**	.01
4	Ambivalence x post-argument attitude	.04	.02	.10		
	MJT score x post-argument attitude	.00	.00	-.01		
	Gender x post-argument attitude	-.07	.04	-.40		
	Baseline attitude x post-argument attitude	-.01	.02	-.03	.10**	.01

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time unless significant changes occurred.
* $p < .05$
** $p < .01$

Discussion

As hypothesized, arguments against meat consumption were successful at changing participants' attitudes towards meat. Attitudes decreased dramatically in response to the first argument, but from there decreased only slightly after each successive argument. The progression over time appears to be a negative curve, though it is possible that attitudes decreased linearly from the first argument onward. A curvilinear progression would indicate denial, as participants "shut down" and failed to make the same degree of attitude change they made to previous arguments. If participants did not become defensive, one would expect attitudes and intentions to continue to change in at least a linear, or perhaps even in an exponentially increasing function, as arguments with different foci converged to form a convincing body of evidence for reducing meat consumption. This effect occurred without regard for the subject of the argument (because of counterbalancing); thus was a saturation effect. A secondary hypothesis was that participants would react to the barrage of arguments by eventually reversing their attitudes and intention change (attitudes would become more pro-meat, and intentions to consume less meat would decrease), but this did not occur.

Women started the experiment with more negative attitudes towards meat, and their attitudes changed more dramatically than men's. Even in modern households women often make the majority of food purchase and preparation decisions, so changing their attitudes might be more important than changing men's. The difference in attitudes did not correspond, however, with a greater change in intention for women. This suggests that a barrier may exist for women that prevents their greater attitude change from transferring to greater intention change. A focus group may be able to pinpoint this barrier, since women must be aware of it for it to influence intention change (rather than an unanticipated barrier that can affect behaviour change). This would be an interesting topic for future

research.

In keeping with the other hypothesis, intentions to reduce meat consumption increased in response to the arguments. Like attitudes, intention change over time progressed in a curvilinear fashion such that each successive argument produced less change than the last, and a plateau occurred before the intentions reached the maximum possible score. Though participants with pro-meat attitudes dropped out more frequently than those with anti-meat attitudes, the intention to treat paradigm limits the possibility of drop-out effects masquerading as treatment effects (both in the case of attitude and intention change). Although it is conceivable that the intention to treat paradigm could cause a curvilinear relationship like the one shown here (as participants drop out their scores cease to change), re-running the analyses without the intention to treat data confirmed that the curvilinear relationship was genuine. When increasing attitude change no longer translates into increasing intention change, this suggests that a barrier known to participants is moderating the effect of attitude on intention change. The barrier could come under the social norm or PBC headings, but I was unable to discover what the barrier was in this case. It is possible that the paragraph about meat substitutes was not effective enough to tackle barriers related to lack of familiarity with low meat and vegetarian meals (as per Hoek et al., 2011; Lea & Worsley, 2008), or that the barrier was household members' diets (Hoek et al., 2011; Larsson et al., 2003), or participants' real or perceived dietary requirements, or some other factor not adequately measured in this experiment.

The curvilinear change in attitudes and intentions is mirrored by the hypothesized decrease in participants' belief in the arguments over time, which is indicative of defensiveness. With a properly counterbalanced order, there is no objective reason why the third argument should be less believable than the first, unless participants experienced cognitive dissonance or anxiety about their behaviour. This anxiety can be easily solved by denying the validity of the arguments; if they are less true, then there is less reason to feel anxious about the subject matter. Another example of defensive

behaviour is that participants who dropped out had more positive attitudes towards meat and experienced more ambivalence towards meat consumption. This suggests that the experiment caused anxiety in those participants, and they dropped out in order to escape it.

More evidence for defensive reactions is in the variables that predict belief in the argument. If participants were truly objective and rational in their analyses of the arguments, then baseline attitude should have had no effect on belief. Instead, in all instances, baseline attitude was the primary predictor of belief, with pro-meat attitudes predicting low belief. Age also predicted belief in the environmental and ethical arguments (older participants believed them less) however age did not predict belief in the health argument. The environmental, and especially the ethical argument, imply that people who eat meat harm other creatures indirectly through environmental degradation, or directly via animal suffering, respectively. The health argument, however, merely implies that people have been harming themselves. It is possible that participants who have been eating meat longer (the older participants) experienced more anxiety and cognitive dissonance as a result of the ethical and environmental arguments than young participants who have only made independent choices about their meat consumption for a few years, and therefore have caused less harm than the older participants. In partial support of this hypothesis, young participants believed in the ethical argument significantly more than older participants, and both groups believed approximately the same amount in the health argument. Though there was a difference in belief in the environmental argument (young participants believed it more), the difference was not significant. Thus there appears to be a defensive reaction to the ethical argument on the part of older participants.

By most definitions of defense mechanisms, any reaction to a stimulus that reduces anxiety (e.g. Funder, 2004; DuNann Winter & Koger, 2010), or improves self-esteem (Baumeister, Dale & Sommer, 1998) can be considered to be a defense mechanism. This definition of defense mechanisms is problematic when conducting research looking for defense mechanisms in

environmental activism research for two reasons. First, it means that both positive and negative reactions to a stimulus (e.g. denial or sublimation) can both be labelled as defense mechanisms. This leaves too many possible outcomes that would indicate defense mechanisms, which is hardly a good hypothesis test. This problem can be solved by specifying levels of defense mechanisms in the hypotheses: immature defenses (denial, devaluation, rationalization, etc.), or mature defenses (humour, sublimation, altruism, etc.). Given that denial is a commonly discussed defense mechanism in eco psychology, the second problem is in distinguishing between healthy scepticism and denial. For this, a definition from outside psychology is useful; Shermer (2010) suggests that sceptics examine the evidence carefully and follow where it leads, whereas deniers simply deny the validity of the argument indefinitely. Thus, assuming the arguments are valid, a curve or plateau in attitude change over time would indicate defensive reactions, but a linear progression would not.

The defensive reactions suggest that, with potentially anxiety-inducing arguments, less is more. There is little point in bombarding people with many arguments against eating meat. Instead, people should be allowed to contemplate and "come to grips" with the new information. When shown arguments against meat consumption the attitudes of participants will become more negative towards meat over the course of a week, even if they are not exposed to further arguments against meat consumption (Berndsen & Van der Pligt, 2005). Of the arguments we evaluated, it appears that the ethical argument produces the most attitude and intention change, followed by the environmental and health arguments, which were equally effective. The ethical argument was also the most believable, followed by the environmental, then health arguments, which at first seems counter-intuitive, because the ethical argument contained the *fewest* references. Meat consumption though, is influenced more by affective than cognitive arguments (Aikman, Crites & Fabrigar, 2006; Berndsen Van der Pligt, 2005), and the ethical argument was more emotive than the other two. It is possible that the relatively cold, intellectual tone of the environmental and health arguments made it easier for participants to use intellectualization as a defense mechanism, thus reducing the anxiety

caused by the arguments, and thereby reducing the need to sublimate the anxiety into attitude and intention change. The health argument was the least emotive, and therefore this interpretation explains why it produced the least attitude and intention change. The greater overall effectiveness of the ethical argument (assuming the effect was not due entirely to tone) also makes intuitive sense. It is difficult to argue that it is ok to cause animals great pain in order to eat large amounts of meat or make lots of money. The ethical argument was closely followed in effectiveness by the environmental one, then by the health argument. That the health argument finished last (though contrary to the hypothesis), upon reflection is not very surprising; people, especially women (the majority of our sample), are told on a regular basis that they need to eat red meat to be healthy. Friends, family members, and even some doctors insist a vegetarian diet is unhealthy despite current dietary guidelines (American Dietetic Association, 2003; Fraser, 2009) and continue to recommend that patients with low iron eat red meat, even though shellfish and many fortified cereals contain far more iron (U.S. Department of Agriculture, 2005). It is impossible with the current paradigm to tease apart the effects of each argument from the effects of the tone. More research using all three arguments with both cold and hot tones will be necessary, though it is possible that the ethical argument, by its very nature, will always evoke more emotions. Therefore special interest groups wishing to promote reduced meat consumption would be wise to ensure that emotive ethical (and environmental) arguments appear first and foremost in their information.

As participants saw more arguments in favour of reducing meat consumption, their attitudes towards meat and intentions to consume it changed favourably, however this change was buffered by the person's belief in the arguments. Whilst prior attitudes influenced beliefs, beliefs in turn mediated the relationship between age and post-argument attitude. Belief also moderated the effect of baseline attitudes on post-argument attitudes; when belief in the argument was low, baseline attitudes predicted post-argument attitudes, but when belief in the argument was high, baseline attitudes were no longer predictive of post-argument attitudes (see Baron & Kenny, 1986 for an

explanation of mediation vs. moderation). Though ambivalence was a significant predictor of intention change in response to the health argument, there was no evidence for a mediating or moderating role of ambivalence to replicate Berndsen and Van der Pligt's (2004) and Sparks et al.'s (2001) findings. Belief in the argument is conceptually related to ambivalence, in that ambivalence is a measure of the variance of attitudes to an object, and might also measure hesitancy to believe the arguments. Thus the variance normally explained by ambivalence may have been subsumed by beliefs in this study.

Though I expected that participants who were able to distinguish between the moral validity of an argument and their personal opinions (as indicated by a high MJT score) would be able to separate the influence of their attitudes from their belief in the arguments, this was not the case. MJT score was not able to predict participants' beliefs in the arguments, or moderate the effect of prior attitude on belief. There are several possible reasons for this. The first is that although the MJT measures moral reasoning, it measures a very rational aspect of it. Since meat consumption is a very affective topic (Aikman, Crites & Fabrigar, 2006; Berndsen & Van der Pligt, 2005), it could be that a test of moral abilities that accounts for affective morality (the “gut feeling” that something is right or wrong) would be more accurate in predicting attitude change (see Matsuba & Walker, 1998). A second, related possibility is that the ability to judge an argument's moral value does not mean that a person is likely to be swayed by the argument; the moral judgement occurs in a cold, intellectual manner, rather than a hot, emotive, and persuasive manner. A third (though I like to think unlikely) possibility is that my own moral judgement ability is rather poor and I was unable to see through my own personal bias to construct arguments with a high level of moral reasoning, thus they were not more persuasive to people with a high moral judgement ability. Though other researchers have previously linked poor moral judgment to use of immature defense mechanisms, we were unable to replicate their results (Hart & Chmiel, 1992; Matsuba & Walker, 1998).

Psychologists should strive to communicate to activists that hostile or degrading reaction are part of a natural, adaptive (though not always optimal) response to anxiety- or dissonance-provoking messages. Activists can be upset and confused when they receive negative reactions, often from the very people they wish to help, and it might help alleviate their distress to know that the defensive reactions are not a result of hatred towards the activist, but instead the result of anxiety or cognitive dissonance within the self. Another important message to communicate to activists is that defensiveness increases with the number of arguments presented to a person, so those wishing to achieve change should encourage people gently, allowing them plenty of opportunity to reflect on the new information. It also appears that belief in the argument is a key determining factor in the effectiveness of an argument, so practitioners, policy makers, and activists alike should ensure they are familiar with the research on trust (see Mayer, Davis & Schoorman, 1995). It is possible, however, to engage people and influence them to change their intentions to consume meat through carefully prepared information alone. When people are told how to include meat alternatives in their meals, it seems that the environmental and animal-rights arguments with an emotive tone are the most effective way to influence people.

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Appendix A: Questionnaire

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17 October, 2011
Department of Psychology

INFORMATION

You are invited to participate as a subject in the research project *Digital Persuasion: Effects of web-based information on attitudes and behaviour.*

The aim of this project is to determine how people interpret and respond to arguments that may or may not align with their own beliefs.

If you agree to take part you will complete a short questionnaire about your current attitudes and diet, then read and respond to three arguments about eating meat. This should take approximately 15 minutes. Upon completing the questionnaire you will be entered into a draw to win one of five Amazon International gift vouchers worth $100 NZD. You may withdraw your participation, including withdrawal of any information you have provided until your questionnaire has been added to the others collected. Because it will be anonymous, it cannot be retrieved after that.

You may experience some mild stress while completing the questionnaire, but it should be no more than you might normally experience in daily life. If you wish to speak with someone about the experiment or your experiences, please contact either Laura Scrimgeour (Laura.Scrimgeour@pg.canterbury.ac.nz) or Deak Helton (Deak.Helton@canterbury.ac.nz).

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, your email address (if you provide it) will be removed from your data when your questionnaire is added to the others.

The project is being carried out as a requirement for a Master of Science by Laura Scrimgeour under the supervision of Deak Helton, who can be contacted at the email addresses above. They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed ***and approved*** by the University of Canterbury Department of Psychology.

Thank you in advance for your contributions.

CONSENT

I have read and understood the description of the above-named project. On this basis I agree to be a participant in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand also that I may withdraw from the project, including withdrawal of any information I have provided until my questionnaire has been added to the others collected.

I note that the project has been reviewed and approved by the University of Canterbury Department of Psychology.

By completing the questionnaire it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project with the understanding that anonymity will be preserved.

If you do not wish to participate, please close your browser window now.

If someone referred you to this questionnaire, please write his or her name below.

First name

Last name

Please enter your email address below.
Your email will be kept confidential and will only be used to contact you in the event that you win the prize draw or wish to know the results of the study. Email addresses will be deleted from the data set when the research is complete.

- [ ] Please email me the main results of the study when it is complete

Age

Gender

- [ ] Male
- [ ] Female

Nationality

In which country do you currently live?

Occupation / current field of study

Highest level of education completed.

- [ ] some high school
- [ ] completed high school
- [ ] some post-secondary/tertiary (e.g. university, apprenticeship, college [Canada and U.S.], or polytechnic [Australia, N.Z.])
- [ ] completed post-secondary degree, diploma or apprenticeship (e.g. Bachelor's degree)
- [ ] some post-graduate education
- [ ] completed a post-graduate qualification
- [ ] completed more than one post-graduate qualification

In the following part you are asked about your opinion on two stories.
Please read the stories carefully and answer the question.
Then you will find arguments for and against the decision in each story. Do you accept or reject them?
Mark your answer on a scale from -4 to +4.

Recently a company fired some people for unknown reasons. Some workers think the managers are listening in on employees through an intercom system and using the information against them. The managers deny this charge. The union says it will only do something about it when there is proof. Two workers then break into the main office and take the tapes that prove the managers were listening in.

	I strongly disagree -3	-2	-1	0	+1	+2	I strongly agree +3
Would you disagree or agree with the workers' behaviour?	○	○	○	○	○	○	○

How acceptable do you find the following arguments *in favour* of the two workers' behaviour? Suppose someone argued they were *right* . . .

	I strongly reject -4	-3	-2	-1	0	+1	+2	+3	I strongly accept +4
because they didn't cause much damage to the company.	○	○	○	○	○	○	○	○	○
because due to the company's disregard for the law, the means used by the two workers were permissible to restore law and order.	○	○	○	○	○	○	○	○	○
because most of the workers would approve of their deed and many of them would be happy about it.	○	○	○	○	○	○	○	○	○
because trust between people and individual dignity count more than the firm's internal regulations.	○	○	○	○	○	○	○	○	○
because the company had committed an injustice first, the two workers were justified in breaking into the offices.	○	○	○	○	○	○	○	○	○
because the two workers saw no legal means of revealing the company's misuse of confidence, and therefore chose what they considered the lesser evil.	○	○	○	○	○	○	○	○	○

How acceptable do you find the following arguments *against* the two workers' behaviour? Suppose someone argued they were *wrong* . . .

	I strongly disagree -4	-3	-2	-1	0	+1	+2	+3	I strongly agree +4
because we would endanger law and order in society if everyone acted as the two workers did.	○	○	○	○	○	○	○	○	○
because one must not violate such a basic right as the right of property ownership and take the law into one's own hands, unless some universal moral principle justifies doing so.	○	○	○	○	○	○	○	○	○
because risking dismissal from the company on behalf of other people is unwise.	○	○	○	○	○	○	○	○	○
because the two should have run through the legal channels at their disposal and not committed a serious violation of the law.	○	○	○	○	○	○	○	○	○
because one doesn't steal and commit burglary if one wants to be considered a decent and honest person.	○	○	○	○	○	○	○	○	○
because the dismissals of the other employees did not affect them and thus they had no reason to steal the transcripts.	○	○	○	○	○	○	○	○	○

A woman had cancer and she had no hope of being saved. She was in terrible pain and so weak that a large dose of a pain killer such as morphine would have caused her death. During a temporary period of improvement, she begged the doctor to give her enough morphine to kill her. She said she could no longer stand the pain and would be dead in a few weeks anyway. The doctor decided to give her an overdose of morphine.

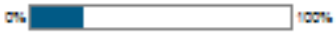
	I strongly disagree -3	-2	-1	0	+1	+2	I strongly agree +3
Do you disagree or agree with the doctor's behaviour?	○	○	○	○	○	○	○

How acceptable do you find the following arguments *in favour* of the doctor? Suppose someone said he acted *rightly* . . .

	I strongly disagree -4	-3	-2	-1	0	+1	+2	+3	I strongly agree +4
because the doctor had to act according to his conscience. The woman's condition justified an exception to the moral obligation to preserve life.	○	○	○	○	○	○	○	○	○
because the doctor was the only one who could fulfill the woman's wish; respect for her wish made him act as he did.	○	○	○	○	○	○	○	○	○
because the doctor only did what the woman talked him into doing. He need not worry about unpleasant consequences.	○	○	○	○	○	○	○	○	○
because the woman would have died anyway and it didn't take much effort for him to give her an overdose of a painkiller.	○	○	○	○	○	○	○	○	○
because the doctor didn't really break a law. Nobody could have saved the woman and he only wanted to shorten her suffering.	○	○	○	○	○	○	○	○	○
because most of his fellow doctors would presumably have done the same in a similar situation.	○	○	○	○	○	○	○	○	○

How acceptable do you find the following arguments *against* the doctor? Suppose someone said that he acted *wrongly* . . .

	I strongly disagree -4	-3	-2	-1	0	+1	+2	+3	I strongly agree +4
because he acted contrary to his colleagues' convictions. If they are against mercy-killing the doctor shouldn't do it.	○	○	○	○	○	○	○	○	○
because one should be able to have complete faith in a doctor's devotion to preserving life even if someone with great pain would rather die.	○	○	○	○	○	○	○	○	○
because the protection of life is everyone's highest moral obligation. We have no clear moral criteria for distinguishing between mercykilling and murder.	○	○	○	○	○	○	○	○	○
because the doctor could get himself into much trouble. They have already punished others for doing the same thing.	○	○	○	○	○	○	○	○	○
because he could have had it much easier if he had waited and not interfered with the woman's dying.	○	○	○	○	○	○	○	○	○
because the doctor broke the law. If one thinks that mercy-killing is illegal, then one should refuse such requests.	○	○	○	○	○	○	○	○	○



How many adults (18 years and older or flatmates) *excluding yourself* do you normally share meals with?

- ◯ None
- ◯ One
- ◯ Two
- ◯ Three
- ◯ Four
- ◯ Five or more

How many children (under 18) are there in your household?

- ◯ None
- ◯ One
- ◯ Two
- ◯ Three
- ◯ Four
- ◯ Five or more

Do any of the people with whom you share meals have any dietary restrictions, (e.g. vegetarian, gluten-free, allergies)? If so, what are they?

The following questions ask about the amount of meat you eat. There are no right or wrong answers, we are merely interested in the role meat plays in your diet. Please answer accurately and honestly.

Do you ever eat meat?
The term meat refers to all meat products eaten, varying from steak and schnitzel to cubes of ham, pieces of bacon or minced or ground meat in sauces. It also includes cold meat products used for sandwiches such as salami or ham. Meat also includes wild game and poultry such as chicken or turkey, but for the purposes of this survey does not include fish or eggs.

- ◯ Yes
- ◯ No

On average, how often do you eat meat with your **evening** meal?

- ◯ Never or nearly never
- ◯ Less than once a week
- ◯ Once or twice per week
- ◯ 3-4 times per week
- ◯ 5-6 times per week
- ◯ Daily

When you include meat in your **evening** meal, how much do you normally eat?

- ◯ Not applicable
- ◯ An amount **smaller** than a deck of cards (less than 75g / 2.5oz)
- ◯ About the size of **One** deck of cards (75 - 150g / 2.5 - 5oz)
- ◯ About the size of **Two** decks of cards (151 - 225g / 5.1 - 8oz)
- ◯ About the size of **Three** decks of cards (226 - 300g / 8.1 - 10oz)
- ◯ More than **Three** decks of cards (more than 300g / 10.1 oz)

On average, how often do you eat meat with your **mid day** meal?

- ◯ Never or nearly never
- ◯ Less than once a week
- ◯ Once or twice per week
- ◯ 3-4 times per week
- ◯ 5-6 times per week
- ◯ Daily

When you include meat in your **mid day** meal, how much do you normally eat?

- ◯ Not applicable
- ◯ An amount **smaller** than a deck of cards (less than 75g / 2.5oz)
- ◯ About the size of **One** deck of cards (75 - 150g / 2.5 - 5oz)
- ◯ About the size of **Two** decks of cards (151 - 225g / 5.1 - 8oz)
- ◯ About the size of **Three** decks of cards (226 - 300g / 8.1 - 10oz)
- ◯ More than **Three** decks of cards (more than 300g / 10.1 oz)

On average, how often do you eat meat with your **morning** meal?

- ◯ Never or nearly never
- ◯ Less than once a week
- ◯ Once or twice per week
- ◯ 3-4 times per week
- ◯ 5-6 times per week
- ◯ Daily

When you include meat in your **morning** meal, how much do you normally eat?

- ◯ Not applicable
- ◯ An amount **smaller** than a deck of cards (less than 75g / 2.5oz)
- ◯ About the size of **One** deck of cards (75 - 150g / 2.5 - 5oz)
- ◯ About the size of **Two** decks of cards (151 - 225g / 5.1 - 8oz)
- ◯ About the size of **Three** decks of cards (226 - 300g / 8.1 - 10oz)
- ◯ More than **Three** decks of cards (more than 300g / 10.1 oz)

In the future, do you intend to...

- ◯ eat more meat
- ◯ eat about the same amount of meat
- ◯ eat less meat

The following questions ask about your attitudes towards and beliefs about eating meat. There are no right or wrong answers, so please answer accurately and honestly.

Please indicate your reactions towards eating meat

bad	◯	◯	◯	◯	◯	good
unpleasant	◯	◯	◯	◯	◯	pleasant
against	◯	◯	◯	◯	◯	for
unfavourable	◯	◯	◯	◯	◯	favourable
negative	◯	◯	◯	◯	◯	positive
un-eco	◯	◯	◯	◯	◯	eco
unhealthy	◯	◯	◯	◯	◯	healthy
immoral	◯	◯	◯	◯	◯	moral

Please tell us how much you already know about...

	nothing at all	a little	some	a lot
health benefits of eating meat?	◯	◯	◯	◯
health problems caused by eating meat?	◯	◯	◯	◯
weight loss from eating meat?	◯	◯	◯	◯
overweight problems caused by eating meat?	◯	◯	◯	◯
environmental problems caused by raising meat animals?	◯	◯	◯	◯
environmental benefits of raising meat animals?	◯	◯	◯	◯
ethical problems caused by raising meat animals?	◯	◯	◯	◯
ethical benefits of raising meat animals?	◯	◯	◯	◯

Please indicate how much you agree with the statement below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I feel conflicted about eating meat	○	○	○	○	○
I feel indecisive towards the issue of eating meat	○	○	○	○	○
I have completely clear reactions towards the issue of eating meat	○	○	○	○	○
People who are important to me think that I should eat **more** meat	○	○	○	○	○
I want to do what these important people want me to do	○	○	○	○	○
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
People who are important to me think that I should eat **less** meat	○	○	○	○	○
I want to do what these people want me to do	○	○	○	○	○
I know how or can easily learn how to cook **meatless** main courses	○	○	○	○	○
I know how or can easily learn how to cook main courses **containing meat**	○	○	○	○	○
If I wanted to, I could **reduce** my meat consumption	○	○	○	○	○
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
If I wanted to I could **increase** my meat consumption	○	○	○	○	○
If I wanted to, I could cook **more** meals containing meat	○	○	○	○	○
If I wanted to, I could cook **fewer** meals containing meat	○	○	○	○	○
If I wanted to eat **less** meat I could overcome any obstacles in my path	○	○	○	○	○
If I wanted to eat **more** meat I could overcome any obstacles in my path	○	○	○	○	○

In the following section you will see arguments against eating meat. We are interested in how you understand and interpret arguments, and are using meat consumption as an example. There are no right or wrong answers. Please read the paragraphs and answer the questions as accurately and honestly as possible.

Please read the following paragraphs.

Eating too much meat causes problems for the environment according to the Food and Agriculture Organization of the United Nations (UN FAO, 2006). Meat production produces 18% of global greenhouse gas emissions; more than the entire transport sector (UN FAO, 2006). The Amazon rainforest is being cut down to graze animals – 70% of the deforested land is now used for grazing, in addition to large amounts of land being used to grow animal feed (UN FAO, 2006). Meat production is also one of the biggest causes of species extinctions because of ecosystems being destroyed for pasture and grain production, degraded pasture from over-grazing, and contributions to climate change (UN FAO, 2006). Factory farming and grazing animals are leading causes of water pollution in New Zealand and Canada (Hall, Leavitt, Quinlan, Dixit & Smol, 1999; Unwin, Snelder, Booker, Ballantine & Lessard, 2010; Verburg, Hamill, Unwin & Abell, 2010). Technological advances and better management can reduce the environmental impacts of meat production (UN FAO, 2006), but by far the most effective and immediate improvements can be achieved simply by consuming less meat. If every omnivore in developed nations ate at least one more vegetarian or vegan meal each week, emissions and other impacts of meat production could be reduced by nearly 15% in just a few months.

Eating less meat doesn't mean you (or your family) have to become vegetarian. You can eat beans, lentils, seeds, nuts or tofu instead of meat at one meal each week, or include them in two meals and eat half the meat you normally would at those meals. Replacing half the meat with a serving of beans at two meals is just as effective as eating one vegetarian meal, and is less likely to leave you feeling hungry later. Vegetarian protein sources like beans, nuts, seeds, lentils, or tofu are easy to add to meals like chili, soups, stews, curries, salads and stir fries. Any reduction in your meat consumption, no matter how small, will have a positive effect.

Below are questions you may have answered once already. Please respond as sincerely as you did the first time, so we can see if your answers have changed.

Please describe what you thought about or felt while your were reading the text above.

The following questions are about the information you just read.

	Not at all		Somewhat		Very much
How much did the information convince you?	○	○	○	○	○
Do you agree with the content?	○	○	○	○	○
How informative was it for you?	○	○	○	○	○
Did the last paragraph help you feel more able to eat less meat?	○	○	○	○	○
How truthful did the information seem?	○	○	○	○	○

	None at all		Some		All or nearly all
How much of the information was new to you?	○	○	○	○	○

The following questions ask about your attitudes towards and beliefs about eating meat. There are no right or wrong answers, so please answer accurately and honestly.

Please indicate your reactions towards eating meat

bad	○ ○ ○ ○ ○	good
unpleasant	○ ○ ○ ○ ○	pleasant
against	○ ○ ○ ○ ○	for
unfavourable	○ ○ ○ ○ ○	favourable
negative	○ ○ ○ ○ ○	positive
un-eco	○ ○ ○ ○ ○	eco

The following questions are about the information you just read.

	Not at all		Somewhat		Very much
How much did the information convince you?	○	○	○	○	○
Do you agree with the content?	○	○	○	○	○
How informative was it for you?	○	○	○	○	○
Did the last paragraph help you feel more able to eat less meat?	○	○	○	○	○
How truthful did the information seem?	○	○	○	○	○

	None at all		Some		All or nearly all
How much of the information was new to you?	○	○	○	○	○

The following questions ask about your attitudes towards and beliefs about eating meat. There are no right or wrong answers, so please answer accurately and honestly.

Please indicate your reactions towards eating meat

bad	○	○	○	○	○	good
unpleasant	○	○	○	○	○	pleasant
against	○	○	○	○	○	for
unfavourable	○	○	○	○	○	favourable
negative	○	○	○	○	○	positive
un-eco	○	○	○	○	○	eco
unhealthy	○	○	○	○	○	healthy
immoral	○	○	○	○	○	moral

In the future, do you intend to...

- ○ eat more meat
- ○ eat about the same amount of meat
- ○ eat less meat

Please read the following paragraphs.

Eating too much meat causes problems for your health according to a recent review by Fraser (2009), the American Dietetic Association and the Dietitians of Canada (2003). Vegetarians have a lower risk for heart disease, obesity, colon and prostate cancer, diabetes, high cholesterol, and hypertension than omnivores (American Dietetic Association, 2003; Fraser, 2009). Animal products are high in unhealthy saturated fats, which should be avoided to maintain a healthy weight (Health Canada, 2007; New Zealand Ministry of Health [MOH], 2005; World Health Organization,n.d.), and are not necessary for a healthy diet as long as a variety of pulses (legumes; beans, dried peas, lentils), nuts, seeds, whole-grains, fruits and vegetables are consumed (American Dietetic Association, 2003; MOH, 2005). Health Canada (2007) recommends frequently replacing meat with pulses (legumes) and tofu. A diet rich in whole-grains, beans, lentils, nuts, seeds, leafy greens and vitamin C will contain adequate protein and iron (MOH, 2005). In addition, vegetarian diets are often lower in saturated fats and cholesterol than omnivorous diets, and are higher in fiber, vitamins C and E, and other essential nutrients (American Dietetic Association, 2003). As a result, reducing meat consumption by at least one meal per week should help a person to lose weight and reduce the risks for a wide range of deadly diseases.

Eating less meat doesn't mean you (or your family) have to become vegetarian. You can eat beans, lentils, seeds, nuts or tofu instead of meat at one meal each week, or include them in two meals and eat half the meat you normally would at those meals. Replacing half the meat with a serving of beans at two meals is just as effective as eating one vegetarian meal, and is less likely to leave you feeling hungry later. Vegetarian protein sources like beans, nuts, seeds, lentils, or tofu are easy to add to meals like chili, soups, stews, curries, salads and stir fries. Any reduction in your meat consumption, no matter how small, will have a positive effect.

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The following questions are about the information you just read.

	Not at all		Somewhat		Very much
How much did the information convince you?	○	○	○	○	○
Do you agree with the content?	○	○	○	○	○
How informative was it for you?	○	○	○	○	○
Did the last paragraph help you feel more able to eat less meat?	○	○	○	○	○
How truthful did the information seem?	○	○	○	○	○

	None at all		Some		All or nearly all
How much of the information was new to you?	○	○	○	○	○

The following questions ask about your attitudes towards and beliefs about eating meat. There are no right or wrong answers, so please answer accurately and honestly.

Please indicate your reactions towards eating meat

bad	○ ○ ○ ○ ○	good
unpleasant	○ ○ ○ ○ ○	pleasant
against	○ ○ ○ ○ ○	for
unfavourable	○ ○ ○ ○ ○	favourable
negative	○ ○ ○ ○ ○	positive
un-eco	○ ○ ○ ○ ○	eco
unhealthy	○ ○ ○ ○ ○	healthy
immoral	○ ○ ○ ○ ○	moral

In the future, do you intend to...

- ○ eat more meat
- ○ eat about the same amount of meat
- ○ eat less meat

Please read the following paragraphs.

Eating too much meat causes problems for the ethical treatment of farm animals. To meet a growing consumer demand, in New Zealand pigs and poultry (chickens, turkeys) are often raised in factory farms (Ministry of Agriculture and Farming, 2009). Over 90% of all meat produced in Canada comes from factory farms (MacLachlan, 2011). Factory farms are industrial meat-production facilities where animals are treated like step in a production line. The animals are crowded so tightly they can barely move and are denied access to sunlight, fresh air and pasture. The factories are often so full of manure that respiratory problems and other diseases are frequent. These conditions stress the animals and make them more likely to fight, so often poultry have their beaks cut off and pigs are confined to crates so they cannot interact with each other. In New Zealand and Canada pregnant and lactating pigs are commonly confined to tiny crates, so small they cannot move around. If dogs or cats were treated as farm animals are, their owners would be charged with cruelty to animals. Farm animals exhibit behaviours that in a human would be interpreted as fear, stress, pain, despair and sadness. They deserve to be treated with respect, allowed to move freely, and exhibit natural foraging and play behaviours for their short lives. Until laws are changed to protect these animals from needless cruelty, the best thing people can do for them is to refuse to support cruel farming practices by refusing to buy factory farmed meat. Eating beans instead of meat for supper at least once each week will reduce the demand for factory farmed meat and will help to save thousands of animals from needless cruelty.

Eating less meat doesn't mean you (or your family) have to become vegetarian. You can eat beans, lentils,

Please read the following paragraphs.

Eating too much meat causes problems for the ethical treatment of farm animals. To meet a growing consumer demand, in New Zealand pigs and poultry (chickens, turkeys) are often raised in factory farms (Ministry of Agriculture and Farming, 2009). Over 90% of all meat produced in Canada comes from factory farms (MacLachlan, 2011). Factory farms are industrial meat-production facilities where animals are treated like step in a production line. The animals are crowded so tightly they can barely move and are denied access to sunlight, fresh air and pasture. The factories are often so full of manure that respiratory problems and other diseases are frequent. These conditions stress the animals and make them more likely to fight, so often poultry have their beaks cut off and pigs are confined to crates so they cannot interact with each other. In New Zealand and Canada pregnant and lactating pigs are commonly confined to tiny crates, so small they cannot move around. If dogs or cats were treated as farm animals are, their owners would be charged with cruelty to animals. Farm animals exhibit behaviours that in a human would be interpreted as fear, stress, pain, despair and sadness. They deserve to be treated with respect, allowed to move freely, and exhibit natural foraging and play behaviours for their short lives. Until laws are changed to protect these animals from needless cruelty, the best thing people can do for them is to refuse to support cruel farming practices by refusing to buy factory farmed meat. Eating beans instead of meat for supper at least once each week will reduce the demand for factory farmed meat and will help to save thousands of animals from needless cruelty.

Eating less meat doesn't mean you (or your family) have to become vegetarian. You can eat beans, lentils, seeds, nuts or tofu instead of meat at one meal each week, or include them in two meals and eat half the meat you normally would at those meals. Replacing half the meat with a serving of beans at two meals is just as effective as eating one vegetarian meal, and is less likely to leave you feeling hungry later. Vegetarian protein sources like beans, nuts, seeds, lentils, or tofu are easy to add to meals like chili, soups, stews, curries, salads and stir fries. Any reduction in your meat consumption, no matter how small, will have a positive effect.

Below are questions you may have answered once already. Please respond as sincerely as you did the first time, so we can see if your answers have changed.

Please describe what you thought about or felt while your were reading the text above.

The following questions are about the information you just read.

	Not at all		Somewhat		Very much
How much did the information convince you?	○	○	○	○	○
Do you agree with the content?	○	○	○	○	○
How informative was it for you?	○	○	○	○	○
Did the last paragraph help you feel more able to eat less meat?	○	○	○	○	○
How truthful did the information seem?	○	○	○	○	○

	None at all		Some		All or nearly all
How much of the information was new to you?	○	○	○	○	○

The following questions ask about your attitudes towards and beliefs about eating meat. There are no right or wrong answers, so please answer accurately and honestly.

Please indicate your reactions towards eating meat

bad	○	○	○	○	○	good
unpleasant	○	○	○	○	○	pleasant
against	○	○	○	○	○	for
unfavourable	○	○	○	○	○	favourable
negative	○	○	○	○	○	positive
un-eco	○	○	○	○	○	eco
unhealthy	○	○	○	○	○	healthy
immoral	○	○	○	○	○	moral

In the future, do you intend to...

- ○ eat more meat
- ○ eat about the same amount of meat
- ○ eat less meat

Appendix B: Predictors of post argument attitudes.

Table A 1
Predictors of post ethic argument attitudes

Step	Predictor variable	B	SE B	β	Model R^2	R^2 *change*
1						
	Baseline attitude***	.97	.04	.90		
	Gender**	-.21	.06	-.09		
	Age*	.01	.00	.07		
	Social Norm	-.02	.01	-.06		
	Meat consumption	-.04	.02	-.06		
	PBC	.07	.05	.04		
	MJT score	.00	.00	.01		
	Education	-.00	.02	-.00	.80***	.80***
2	Beliefs in environmental argument***	-.20	.03	-.15	.82***	.02***
3	Ambivalence	-.03	.03	-.03	.82***	.00
4	Ambivalence x baseline attitude	-.02	.03	-.02		
	Gender x baseline attitude	-.08	.06	-.13		
	MJT score x baseline attitude	.00	.00	-.02		
	Belief in argument x baseline attitude**	-.09	.03	-.08	.83***	.01**

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time. Any significant changes in variables from one step to the next are reported in the text.
* $p < .05$
** $p < .01$
*** $p < .001$

Table A 2
Predictors of post health argument attitudes

Step	Predictor variable	B	SE B	β	Model R^2	R^2 *change*
1	Baseline attitude***	.99	.04	.94		
	Age**	.01	.00	.08		
	Gender*	-.15	.06	-.07		
	Social Norm	-.02	.01	-.05		
	Meat consumption	-.04	.02	-.07		
	PBC	.03	.05	.02		
	MJT score	.00	.00	.04		
	Education	-.00	.02	-.01	.83***	.83***
2	Beliefs in environmental argument***	-.20	.03	-.15	.85***	.02***
3	Ambivalence	-.04	.03	-.04	.85***	.00
4	Ambivalence x baseline attitude	-.04	.03	-.04		
	Gender x baseline attitude	-.02	.05	-.03		
	MJT score x baseline attitude	.00	.00	.01		
	Belief in argument x baseline attitude*	-.06	.03	-.05	.85***	.00

Notes: enter method used
All variables are carried over from the previous to the next step, but for the sake of brevity are not reproduced a second time. Any significant changes in variables from one step to the next are reported in the text.
* $p < .05$
** $p < .01$
*** $p < .001$